

- 1 1. A method for auto-configuring at least one layer three device in a computer
- 2 network with Internet Protocol (IP) parameters, including one or more IP addresses, the
- 3 at least one layer three device having a plurality of interfaces, one or more interfaces
- 4 representing a logical connection to the network and the network including at least one
- 5 server in communicating relationship with the at least one layer three device, the
- 6 method comprising the steps of:
 - 7 broadcasting a discover message from the at least one layer three device, the
 - 8 discover message indicating that the at least one layer three device is requesting
 - 9 assignment of an overall IP address;
 - 10 sending a offer message, in response to the discover message, from the server to
 - 11 the at least one layer three device, the offer message including a proffered IP address
 - 12 for use as an overall IP address;
 - 13 sending a request message, in response to the offer, from the layer three device
 - 14 to the server, the request message indicating that the at least one layer three device has
 - 15 accepted the proffered overall IP address;
 - 16 sending an acknowledgment, in response to the request message, from the
 - 17 server to the layer three device, confirming receipt of the request message; and
 - 18 committing the accepted overall IP address at the at least one layer three device
 - 19 in response to the acknowledgment.

1 2. A method for auto-configuring at least one layer three device in a computer
2 network with Internet Protocol (IP) parameters, including one or more IP addresses, the
3 at least one layer three device having a plurality of interfaces, one or more interfaces
4 representing a logical connection to the network and the network including at least one
5 server in communicating relationship with the at least one layer three device, the
6 method comprising the steps of:
7 broadcasting a second discover message only from an interface of the at least
8 one layer three device that provides connectivity via the network to the server, the
9 second discover message indicating that the at least one layer three device is requesting
10 assignment of one or more IP addresses for the respective interface;
11 a sending a second offer message, in response to the second discover message,
12 from the server to the at least one layer three device, the second offer message
13 including one or more proffered IP addresses for assignment to the respective interface;
14 sending a second request message, in response to the second offer, from the
15 layer three device to the server, the second request message indicating that the at least
16 one layer three device has accepted the proffered one or more IP addresses for the
17 respective interface;
18 sending a second acknowledgment, in response to the second request message,
19 from the server to the layer three device, confirming receipt of the second request
20 message; and
21 committing the accepted IP address at the respective interface of the at least one
22 layer three device in response to the second acknowledgment.

1 3. A method for auto-configuring at least one layer three device in a computer
2 network with Internet Protocol (IP) parameters, including one or more IP addresses, the
3 at least one layer three device having a plurality of interfaces, one or more interfaces
4 representing a logical connection to the network and the network including at least one
5 server in communicating relationship with the at least one layer three device, the
6 method comprising the steps of:

7 broadcasting a third discover message only from an interface of the at least one
8 layer three device that provides connectivity via the network to the server, the second
9 discover message indicating that the at least one layer three device is requesting
10 assignment of one or more IP addresses for an interface lacking connectivity to the
11 server;

12 a sending a third offer message, in response to the third discover message, from
13 the server to the at least one layer three device, the third offer message including at
14 least one or more proffered IP addresses for assignment to the interface lacking
15 connectivity to the server;

16 sending a third request message, in response to the third offer, from the layer
17 three device to the server, the third request message indicating that the at least one layer
18 three device has accepted the proffered one or more IP addresses for the interface
19 lacking connectivity to the server;

20 sending a third acknowledgment, in response to the third request message, from
21 the server to the layer three device, confirming receipt of the third request message;
22 and

23 committing the accepted IP address at the interface lacking connectivity to the
24 server of the at least one layer three device in response to the third acknowledgment.

1 4. The method of claim 1 wherein the discover message includes a first option
2 that is marked by the at least one layer three device to indicate that it is requesting
3 assignment of a general IP address.

1 5. The method of claim 4 wherein the offer message includes the first option
2 marked by the server to indicate that the proffered IP address is an overall IP address.

1 6. The method of claim 3 wherein the second offer message includes a first
2 option marked by the at least one layer three device to indicate that it is requesting
3 assignment of one or more IP addresses for the respective interface.

1 7. The method of claim 6 wherein the second offer message includes the first
2 option marked by the server to indicate that the proffered one or more IP addresses are
3 for use with the respective interface.

1 8. The method of claim 7 wherein the third offer message includes the first
2 option marked by the at least one layer three device to indicate that it is requesting
3 assignment of one or more IP addresses for the interface lacking connectivity to the
4 server.

1 9. The method of claim 8 wherein the second offer message includes the first
2 option marked by the server to indicate that the one or more proffered IP addresses are
3 for use with the interface lacking connectivity to the server.

1 10. The method of claim 9 wherein the second offer message includes a second
2 option containing each proffered IP address and its associated subnet mask for the
3 respective interface.

1 11. The method of claim 10 wherein the second offer includes a third option
2 identifying the routing protocol to be used by the layer three switch with the respective
3 interface.

1 12. The method of claim 11 wherein the third offer message includes the second
2 option containing each proffered IP address and its associated subnet mask for the
3 interface lacking connectivity to the server.

1 13. The method of claim 12 wherein the third offer includes a third option
2 identifying the routing protocol to be used by the layer three switch with the interface
3 lacking connectivity to the server.

1 14. The method of claim 13 wherein the second and third offers each further
2 include, for each proffered IP address, a corresponding lease time indicating the life of
3 the respective proffered IP address.

1 15. The method of claim 1 wherein the server proffers a general IP address
2 from a pre-configured cache of available IP addresses stored at the server each having a
3 pre-defined prefix.

1 16. An option embedded within one or more messages exchanged between a
2 layer three device and a server connected to a computer network for auto-configuring
3 the layer three device with Internet Protocol (IP) configuration parameters, including at
4 least an IP address, the layer three device having a plurality of interfaces each
5 representing a logical connection to the computer network, the option being stored at a
6 memory of either the layer three device or the server, the option comprising:

7 a code field containing a predefined octet indicating that the option is for use in
8 auto-configuring a layer three device; and
9 a type field which is loaded by the layer three device or server sending the
10 message in which the option is embedded,

11 wherein the type field is loaded with a first value by the layer three device to
12 indicate that the corresponding message is a request for assignment of an overall IP
13 address or a second value by the server to indicate that the corresponding message
14 contains a proffered overall IP address.

1 17. The option of claim 16 wherein the type field further may be loaded with a
2 third value by the layer three device to indicate that the corresponding message is a
3 request for assignment of one or more IP addresses for an interface having connectivity

4 to the server or a fourth value by the server to indicate that the corresponding message
5 contains one or more proffered IP addresses for assignment to an interface having
6 connectivity to the server.

1 18. The option of claim 17 wherein the type field further may be loaded with a
2 fifth value by the layer three device to indicate that the corresponding message is a
3 request for assignment of one or more IP addresses for an interface lacking connectivity
4 to the server or a sixth value by the server to indicate that the corresponding message
5 contains one or more proffered IP addresses for assignment to an interface lacking
6 connectivity to the server.

1 19. An option embedded within one or more messages exchanged between a
2 layer three device and a server connected to a computer network for auto-configuring
3 the layer three device with Internet Protocol (IP) configuration parameters, including at
4 least an IP address, the layer three device having a plurality of interfaces each
5 representing a logical connection to the computer network, the option being stored at a
6 memory of either the layer three device or the server, the option comprising:

7 a code field containing a predefined octet indicating that the option is for use in
8 auto-configuring a layer three device; and
9 one or more IP address/subnet fields, each IP address/subnet field containing a
10 proffered IP address and its corresponding subnet for use on a given interface of the
11 layer three device.

1 20. An option embedded within one or more messages exchanged between a
2 layer three device and a server connected to a computer network for auto-configuring
3 the layer three device with Internet Protocol (IP) configuration parameters, including at
4 least an IP address, the layer three device having a plurality of interfaces each
5 representing a logical connection to the computer network, the option being stored at a
6 memory of either the layer three device or the server, the option comprising:
7 a code field containing a predefined octet indicating that the first option is for
8 use in auto-configuring a layer three device; and
9 protocol parameter field containing a value identifying a specific routing
10 protocol for on a given interface of the layer three device.

1 21. A layer three device for connection to a computer network having at least
2 one server, the layer three device having a plurality of interfaces each representing a
3 logical connection to the computer network, the layer three device comprising:
4 a message transmitter connected to the computer network; and
5 a message receiver connected to the computer network,
6 wherein the message transmitter is configured and arranged to formulate and
7 broadcast a discover message requesting assignment of an overall IP address, the
8 message receiver is configured and arranged to receive and examine an offer sent by the
9 at least one server, that includes a proffered IP address for use by the layer three device
10 as an overall IP address, the message transmitter is further configured and arranged to
11 formulate and send to the server a request message, in response to the offer, indicating
12 that the layer three device has accepted the proffered overall IP address and the

13 message receiver is further configured and arranged to receive and examine an
14 acknowledgment from the at least one server that confirms its receipt of the request
15 message.

1 **22. A method for automatically assigning a new subnet to a subnetwork having**
2 **an existing subnet, the subnetwork including one or more layer three devices and a**
3 **plurality of hosts, the method comprising the steps of:**
4 **monitoring the utilization of the existing subnet by the subnetwork;**
5 **determining whether the utilization of the existing subnet exceeds one or more**
6 **pre-defined thresholds;**
7 **in response to the step of the determining, allocating a new subnet for use by the**
8 **subnetwork;**
9 **assigning at least one Internet Protocol (IP) address from the newly allocated**
10 **subnet to each of the one or more layer three switches;**
11 **assigning an IP address from the newly allocated subnet to each host that issues**
12 **a request to renew its IP address;**
13 **forcing any hosts that have not been assigned an IP address from the newly**
14 **allocated subnet to discard their original IP address and request a new IP address;**
15 **in response to the forcing step, assigning an IP address from the newly allocated**
16 **subnet to each host that was forced to discard its original IP address.**